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(54) Replaceable windguard tines for a round baler

(57) The device consists of a replaceable windguard tine (44) for a windguard assembly on an agricultural harvesting machine, such as a round baler (1). The windguard tine (44) comprises a first tine portion (41) parallel to a second tine portion (42). A support region (43) connects the first tine portion and second tine por-

tion. The windguard pipe (50) has a series of tine apertures (51) through which the first and second tine portions are inserted. The support region (43) is bound to the windguard pipe (50) by using a clip (45). The clip (45) has a tine catch (46) and a pipe release (47) to allow for easy removal and installation of the windguard tine (44).

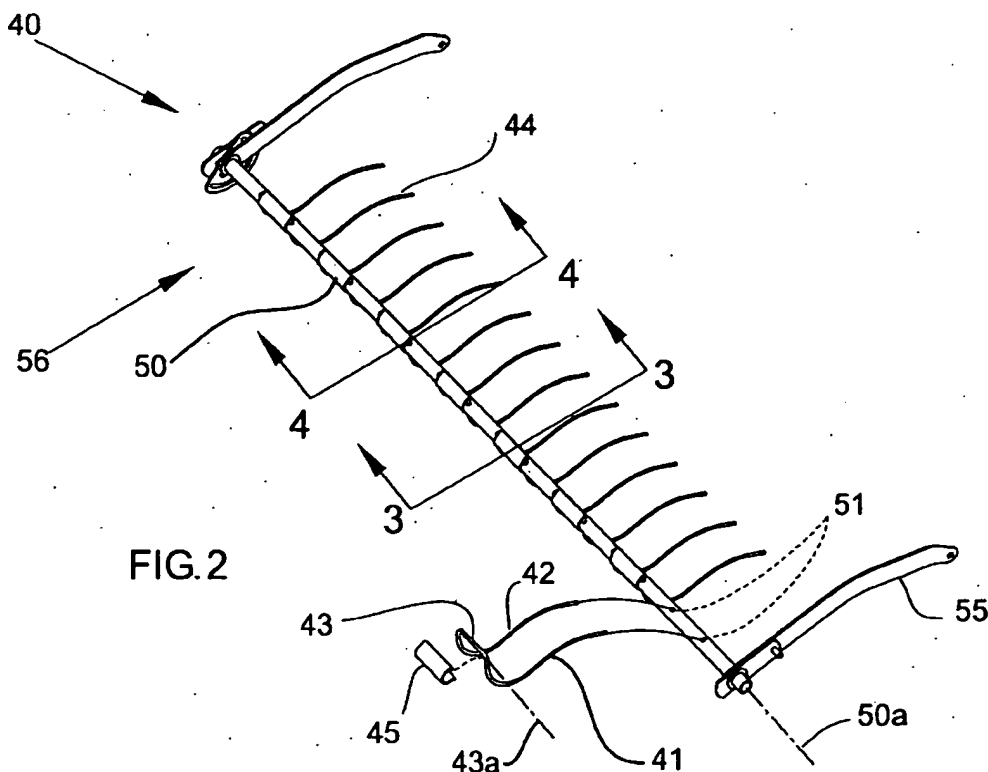


FIG. 2

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Description

[0001] This invention relates to the improvement of an agricultural harvesting machine. More specifically it relates to an improvement for the attachment and removal of windguard tines on a windguard assembly above the pickup means on such machine.

[0002] Agricultural round balers have been used for several decades to collect and bind crop material so as to facilitate the storage of crop material for later use. Generally, a mower or mower-conditioner cuts the crop and arranges it in a windrow for drying. Later, an agricultural tractor pulls a baler over the windrow to collect the crop material. The baler's pickup gathers the cut and windrowed crop and lifts it into the baling chamber. The baling chamber consists of a pair of opposing sidewalls with a series of belts or rollers that rotate and compress the crop material into a cylindrically shaped bale. When the bale has achieved a desired size and density, the operator wraps the bale to ensure that the cylindrical and compact nature of the bale is maintained. There are many wrapping materials and methods of wrapping the bale depending on a variety of factors. Initially, twine was used to wrap the bale. Later netwrap and silage sheets were introduced. After the bale is bound or wrapped, the farmer ejects it from the baler for later pickup.

[0003] As previously mentioned, there are a variety of agricultural round balers. A general example of this device is illustrated by the Roll-Belt™ Round Baler model number 678 manufactured by New Holland North America, Inc. Generally, balers are pulled by an agricultural tractor and receive rotational power from the tractor's power-take-off shaft positioned at the rear of the tractor. The energy is transmitted to a gearbox positioned on the baler. Some balers also use a hydraulic motor and pump arrangement to provide energy to the various baler elements such as the various rollers and belts.

[0004] As previously discussed, located near the front of the baler is the windrow pickup. This assembly picks up the windrow and feeds it into the baling chamber. Positioned above the windrow pickup is the windguard assembly. It ensures that the crop material is properly feed into the baling chamber in spite of any wind or varying crop conditions. Typically, the windguard assembly consists of a pipe and a series of windguard tines held in position above and in front of the pickup. The pipe may be raised or lowered by adjusting a chain and a tine adjustment mechanism. Affixed to the pipe are a series of windguard tines. These tines frequently break off or are damaged during the life of the baler. The windguard tines are typically wrapped, welded or bolted onto the pipe making replacement difficult. The prior art shows a variety of means to attach the windguard tines to the pipe, however these methods have not been entirely successful.

[0005] US-A-4,565,057, US-A-4,524,576 and US-A-4,463,546 disclose conventional methods for attaching

a tine to a pipe. US-A-4,565,057 illustrates a pair of tines wrapped about the pipe. US-A-4,524,576 illustrates some tines inserted through the pipe and other tines bolted on the pipe. US-A-4,463,546 illustrates tines that are bolted to a surface or pipe. It is difficult to remove the remaining portion of the tine. Furthermore it is difficult to replace such tines without proper tools or welding devices. US-A-2,603,936 discloses a snap lock pickup finger for harvester reels. In this approach, a portion of the tine is inserted into a circular member that is integral to the tine. However, with this approach, it is difficult to make a tine with a sufficient material cross section capable of being bent and surviving the rigors of a harvesting environment. A tine of this design would have to have a fairly thin cross section that would limit its ability to retain its shape or survive during the relatively harsh baling processes.

[0006] Consequently, the need exists for an improved windguard tine that can be easily removed for servicing or replacement with a minimum of tools.

[0007] According to one aspect of the present invention, there is provided an agricultural harvesting machine comprising:

- a main frame;
- a pickup attached to said main frame for picking up a windrow and feeding it into said harvesting machine; and
- a windguard assembly arranged above said pickup for ensuring proper feeding of said windrow, said windguard assembly comprising a pair of windguard arms, a windguard pipe affixed between the windguard arms and a windguard tine attached to said windguard pipe,

characterised in that said windguard assembly further comprises a removable clip for attaching said windguard tine to said windguard pipe.

[0008] The invention overcomes the deficiencies of the prior art. The windguard pipe may have tine apertures therein for insertion of a first and a second tine portion of the windguard tine. A support region may connect the first and second tine portions. Advantageously, the removable clip may have a tine catch and pipe release for binding the support region of the windguard tine to the windguard pipe. The use of the clip with a pipe release allows the windguard tine to be easily removed without tools for either repair or replacement of the tine.

[0009] According to a further aspect of the present invention, there is provided a method for attaching a windguard tine to a windguard pipe on an agricultural harvesting machine, said method comprising the steps of:

- inserting a first tine portion and a second tine portion of a windguard tine through tine apertures on the windguard pipe; and
- positioning a support region extending between the

first tine portion and second tine portion into contact with the windguard pipe;

characterised in that it comprises the further steps of:

placing a tine catch of a clip onto the support region; expanding the clip by exerting a force on a pipe release on the clip; and sliding the clip around the windguard pipe.

[0010] The advantages of this invention will be apparent upon consideration of the following detailed disclosure of the invention, especially when taken in conjunction with the accompanying drawings wherein:

Figure 1 is a side elevation of a round baler with parts in position to begin picking up crop material to from a cylindrical bale;

Figure 2 is an isometric view of the windguard assembly, with an exploded view of the tine attachment means;

Figure 3 is cut away view of along line 3 of figure 2 to better show the parts relating to tine attachment; and

Figure 4 is a cut away view of along line 4 of Figure 2 to better show the tine apertures.

[0011] Referring to the drawings, it is possible to observe the major elements and general operation of the present invention. Left and right references are used as a matter of convenience and are determined by standing at the rear of the round baler and facing the forward end in the normal direction of travel. Likewise, forward and rearward are determined by normal direction of travel of the tractor or round baler. Upward or downward orientations are relative to the ground or operating surface. Horizontal or vertical planes are also relative to ground.

[0012] Figure 1 illustrates a conventional round baler 1 with the baling chamber 24a ready to receive crop material. The round baler 1 is attached to a tractor (not shown) by means of a tongue 4. Rotational power from the tractor's power-take-off shaft (not shown) is transmitted to a gearbox (not shown) via a drive shaft. This is the source of power to operate the round baler. It is also possible that a hydraulic motor and pump arrangement may be used.

[0013] The round baler 1 has a main frame 2 supported by a pair of wheels (only one shown) 3. A pickup 5 is positioned in front of the wheels 3. The baling chamber 24a is defined by a pair of opposing baling chamber sidewalls 24 and a series of rubber belts defining an apron 23. Further defining the bale chamber 24a is the floor roll 6, starter roll 7 and stationary dimple roll 8 and a sledge assembly 26 pivotally attached to a pivot roll 9. The baling chamber 24a has tailgate 12 that pivots about the tailgate pivot 32 to separate the tailgate 12 from the front portion 39 of the baler 1.

[0014] The series of rubber belts or apron 23 encircle the sledge follower roll 11, drive roll 14, backwrap roll 15, front serpentine roll 16, rear serpentine roll 17, top/front tailgate idler roll 18, top/rear tailgate idler roll 19, middle tailgate idler roll 20, bottom tailgate idler roll 21 and nose roll 22. The length of the apron 23 is adjusted by a pivoting serpentine take up arm 13. The serpentine take up arm 13 rotates counter-clock wise (as seen in figure 1) as the crop material enters the bale chamber 23. The rotation of the serpentine take up arm 13 adjusts the length of the apron 23 that contacts the bale as the size of the bale increases.

[0015] Generally, the tractor pulls the baler 1 over a windrow of previously cut crop. The pickup 5 inserts the crop between the floor roll 6 and starter roll 7 into the baling chamber 24a. As more crop material enters the bale chamber 24a, the serpentine take up arm 13 and sledge assembly 26 rotate counter-clockwise (as viewed in Figure 1) to allow additional crop material to enter the chamber 24a while ensuring that proper pressure is maintained on the bale. When the bale chamber 24a is full, the bale wrapping system 30 engages and wraps the bale. Once the bale is wrapped, the tailgate 12 raises and ejects the bale from the bale chamber 24a and away from the round baler 1 and tractor.

[0016] The elements of the windguard assembly 40 are visible in Figures 2 and 3. As previously mentioned, the windguard assembly 40 consists of a pair of windguard arms 55 attached to the main frame 2 of the round baler 1. Attached to and between the front ends of the arms 55 is the windguard pipe 50. There are a series of holes or tine apertures 51 that are in the windguard pipe 50. A conventional chain (not shown) and a conventional time adjustment mechanism 56 can adjust the vertical position of the pipe 50. As seen in figure 2, the windguard pipe 50 has an axis 50a.

[0017] A series of windguard tines 44 are inserted through the tine apertures 51. Each windguard tine 44 consists of a first tine portion 41 that is generally parallel to a second tine portion 42. Conventionally, windguard tines are generally curved, however a variety of shapes are possible. Connecting the first tine portion 41 and second tine portion 42 is a support region 43. The support region 43 is generally perpendicular to the first tine portion 41 and second tine portion 42. The support region 43 has a support region axis 43a that is generally parallel to the windguard pipe axis 50a after the tine portions 41 and 42 are inserted into the tine apertures 51.

[0018] A clip 45 binds the support region 43 to the pipe 50. As seen in figure 3, the clip 45 has a tine catch 46 that partially encompasses the support region 42. The clip 45 also has a curved pipe release 47. The clip 45 is sufficiently flexible enough to allow the clip 45 to bend, yet strong enough to permit the clip 45 to affix the windguard tine 44 to the pipe 50. The clip 45 encompasses the pipe 50 over at least than 180°, preferably 225° or more.

[0019] Typically, the first tine portion 41 and second

tine portion 42 are inserted into adjacent tine apertures 51 located in the windguard pipe 50. The support region 43 is placed into contact with the pipe 50, such that the support region axis 43a and windguard pipe axis 50a are generally parallel. The tine catch 46 of the clip 45 is placed onto the support region 42. Using the pipe release 47, the clip is pushed or pulled around the pipe 50 until the windguard tine 44 is securely attached to the pipe 50. To remove the tine 44, a force F is exerted near the pipe release 47. This will permit the clip 45 to release the support region 43 of the tine 44. Repairs or replacement of the tine 44 can now be accomplished without the use of tools to remove the tine 44 from the windguard pipe 50.

Claims

1. An agricultural harvesting machine (1) comprising:

a main frame (2);
a pickup (5) attached to said main frame for picking up a windrow and feeding it into said harvesting machine (1); and
a windguard assembly (40) arranged above said pickup (5) for ensuring proper feeding of said windrow, said windguard assembly (40) comprising a pair of windguard arms (55), a windguard pipe (50) affixed between the windguard arms (55) and a windguard tine (44) attached to said windguard pipe (50),

characterised in that said windguard assembly (40) further comprises a removable clip (45) for attaching said windguard tine (44) to said windguard pipe (50).

2. An agricultural harvesting machine according to claim 1, **characterised in that** said clip (45) encompasses said pipe (50) over more than 180°, in particular over more than 225°.
3. An agricultural harvesting machine according to claim 1 or 2, **characterised in that** said windguard pipe (50) comprises a series of tine apertures (51) therein, through which is inserted said windguard tine (44).
4. An agricultural harvesting machine according to any of the preceding claims, **characterised in that** said removable clip (45) comprises a tine catch (46) and a pipe release (47).
5. An agricultural harvesting machine according to any of the preceding claims, **characterised in that** said windguard tine (44) comprises a first tine portion (41) connected to an opposing second tine portion (42) by a support region (43).

6. An agricultural harvesting machine according to claim 5, **characterised in that** said support region (43) has an axis (43a) parallel to an axis (50a) of said windguard pipe (50) when the removable clip (45) affixes said support region (43) to the windguard pipe (50).

7. An agricultural harvesting machine according to claim 6, when appended to claim 4, **characterised in that** said tine catch (46) partially encompasses said support region (43).

8. An agricultural harvesting machine according to any of the preceding claims, **characterised in that** said windguard arms (55) are pivotally affixed to the main frame (2).

9. An agricultural harvesting machine according to any of the preceding claims, **characterised in that** said machine is an agricultural round baler (1), comprising a baling chamber (24a) for a cylindrical bale.

10. A method for attaching a windguard tine (44) to a windguard pipe (50) on an agricultural harvesting machine (1), said method comprising the steps of:

inserting a first tine portion (41) and a second tine portion (42) of a windguard tine (44) through tine apertures (51) on the windguard pipe (50); and
positioning a support region (43) extending between the first tine portion (41) and second tine portion (42) into contact with the windguard pipe (50);

characterised in that it comprises the further steps of:

placing a tine catch (46) of a clip (45) onto the support region (43);
expanding the clip (45) by exerting a force on a pipe release (47) on the clip (45); and
sliding the clip (45) around the windguard pipe (50).

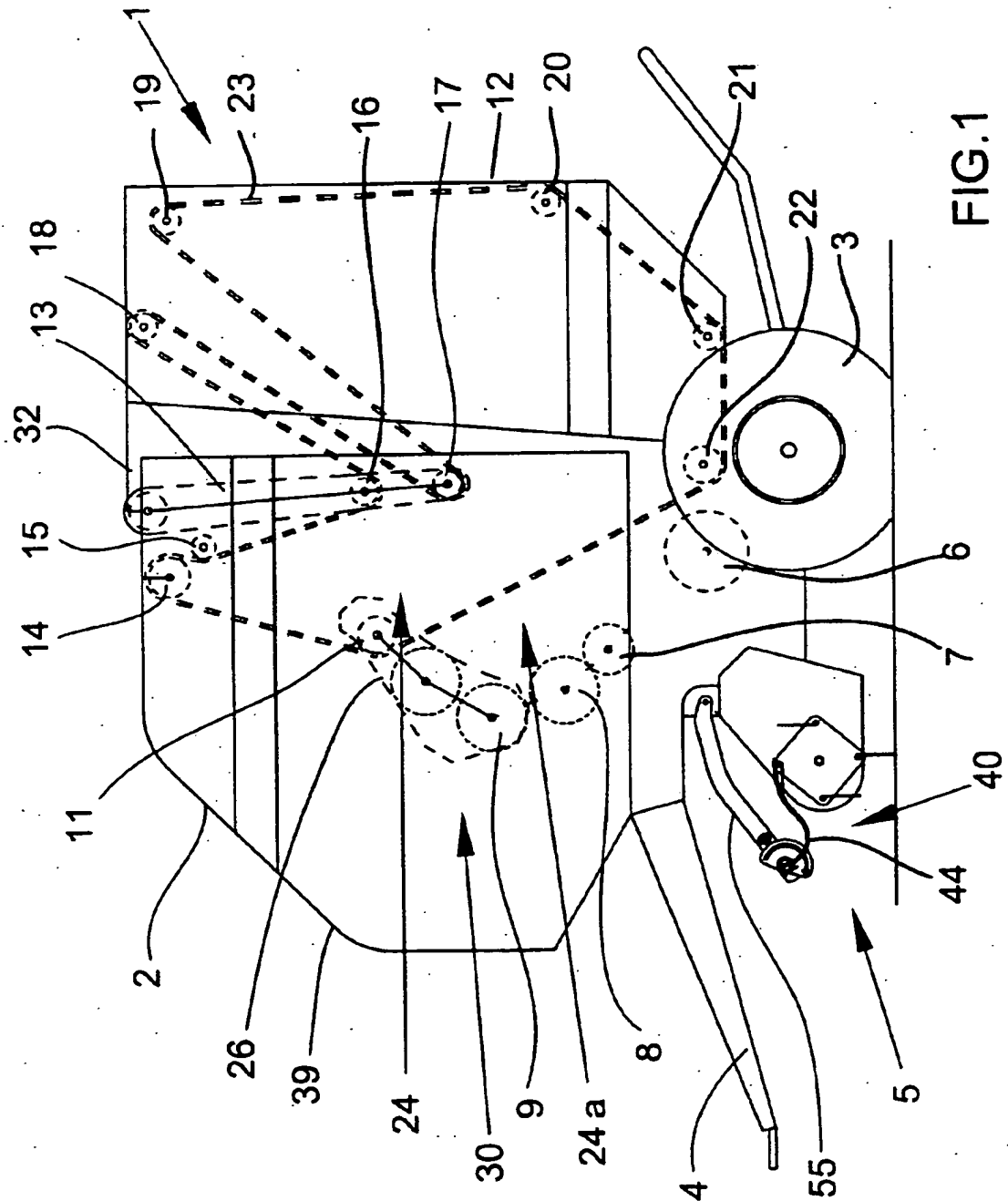
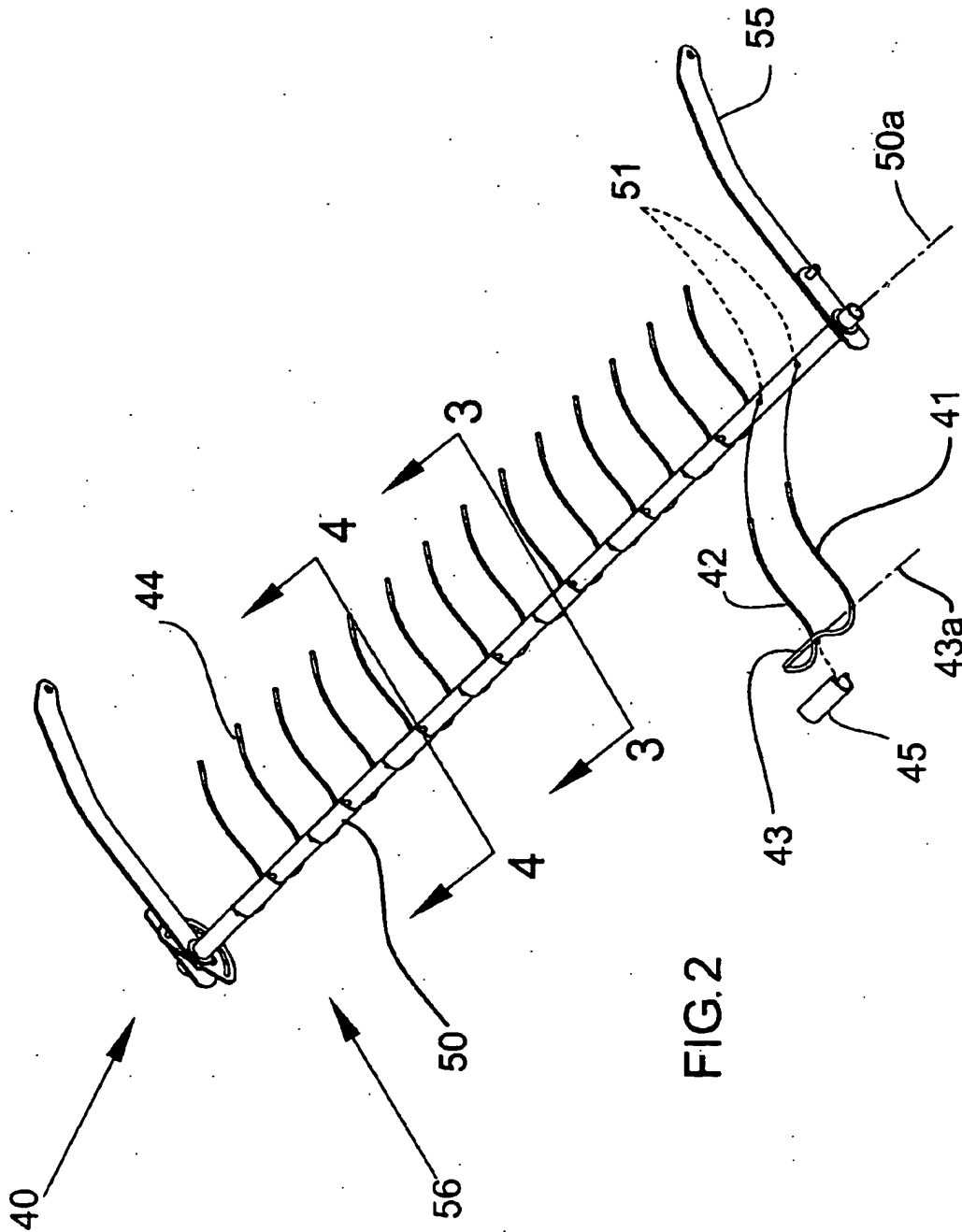


FIG.1



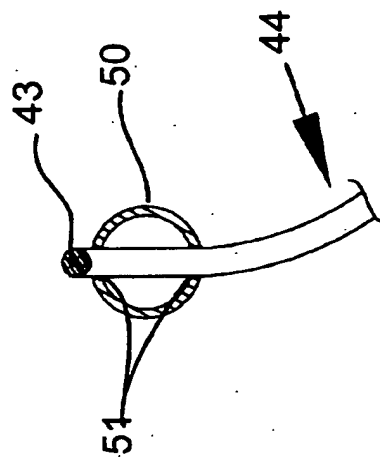


FIG. 4

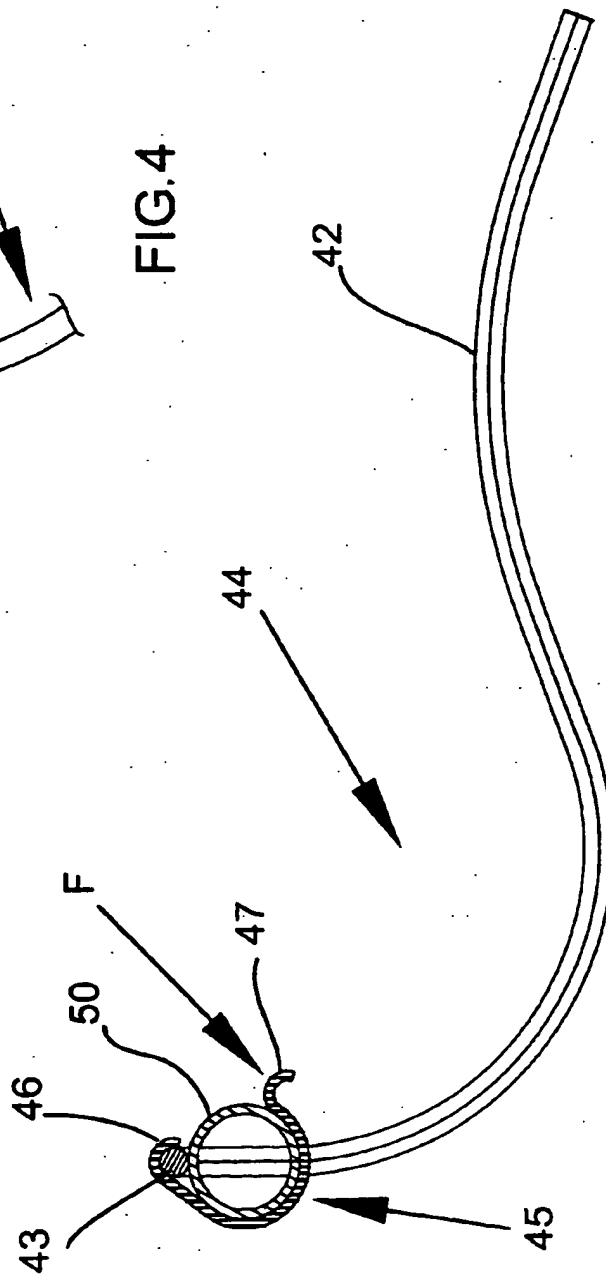


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 03 10 0765

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 25 June 2003	Examiner Bunn, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 (03.02) (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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